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WILLIAM GLEN LISTON, M.B.,

LIEUTENANT, I.M.S.,

Offg. Medical Officer, 6th Infantry, Hyderabad Contingent.

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BY WILLIAM GLEN LISTON, M.B.,

LIEUTENANT, I.M.S.,

Offg. M. O., 6th Infantry, Hyderabad Contingent.

THERE can be little doubt that by far the greater number of cases seen by medical men in this country are cases of fever. In the 6th Infantry, Hyderabad Contingent Hospital, for example 52·4% of the total admissions were for fever during the year ending 31st July 1899. It is evident therefore that a thorough knowledge of the fevers of India is very important for all medical men in this country.

Up to the present too little has been done towards differentiating and classifying the fevers of India. This is partly due to the fact that the majority of the fevers of this country are not associated with any distinctive exanthems, and their clinical symptoms are frequently very much alike. But there are two chief factors

which have hindered the differentiation and proper study of the fevers of India, *viz.*—

(1) The want of adequate apparatus for working with.

(2) The misleading and careless habit of calling every case of fever of short duration, as well as those cases which show an intermittent character, "Ague."

Dr. A. Crombie has attempted a classification of the fevers of India on a clinical basis, which so far as it goes, is of distinct value, while the true cause of the fever still remains unknown. In order that any progress may be made in the study of fevers, it is necessary to apply the knowledge we already possess conscientiously to all cases of fever. We are able at the present time by the microscope to differentiate by an examination of the blood at least four fevers, *viz.*, Malaria, Relapsing Fever, Typhoid (by Widal's test), and Malta Fever. Occasionally we may in cases of Plague find the *Bacillus Pestis* in the blood. If this examination were applied to all cases of fever, without doubt there would remain yet a few cases, which would come under none of these heads, but a number now so small that a comparatively easy study could be made of them.

ie/ & When plague is present in any district its early and correct diagnosis is of the utmost importance. In many suspicious cases it is possible to demonstrate the presence of the *Spirillum Obermeri* or the *Plasmodium Malariae*, and so enable such non-infectious cases to be separated from the infectious or probably infectious, to say nothing of the comfort and relief given to the patient and his friends under such circumstances.

The most difficult type of plague to diagnose perhaps is the primary septicæmic form, and

these are the cases in which a microscopical examination of the blood is most likely to prove of use. I have been able to isolate such cases by finding the bacillus in the blood fifty-one hours before death. It is possible too, that until such a time as the Plague Bacillus is present in the blood (except in pneumonic cases), infection by that case cannot occur, or at least can occur with difficulty; but when the bacillus is present in the blood, it can often be shown to be present in the urine also, and if in that secretion probably in others; but, owing to the presence in these secretions of contaminating microbes of rapid growth, it is difficult to demonstrate the presence of so slow growing a bacillus as that of plague. Hence the detection of the bacillus in the blood is a warning that the case is one from which infection is being spread broadcast.

It is of great use to know that a certain case of fever is a case of "Relapsing Fever" by finding the spirillum of that disease in the blood, for we are then able to keep the patient in bed during the apyrexial period, and so greatly favour the ultimate complete and rapid recovery from the disease by husbanding the patient's strength. We are able too, by judging of the number of spirilla present in a certain sample of blood, to make a shrewd estimate of the probable severity of the disease.

The following extracts from notes of a case of rather complicated diagnosis are of interest as showing the great benefit of an examination of the blood, although negative results may only be obtained.

"Gambai," age fifteen years, wife of musician Kasiram, was first seen by me in the lines on the 11th July 1899. She had been ill at that time for about a fortnight; no definite

date could be attributed to the onset of the disease. She was then suffering from fever and great weakness; diarrhoea with pea-soup stools; pain in the right iliac fossa; slight enlargement of the spleen, a furred tongue. In both lungs over back and front there were numerous large bubbling and small clicking râles, but no dulness on percussion. Considering her condition, I thought it advisable to take her into hospital, the more because a suspicion lurked in my mind that the case might be one of typhoid fever.

On the afternoon of the 11th July while in hospital a thorough examination was made of her condition which was much the same as that mentioned above. Her temperature was 103°F ; pulse rapid and somewhat feeble, but regular and numbering about 115 per minute. The abdomen was carefully examined. No rash was noted. A small tumour was detected a little to the left of the middle line and slightly above the umbilicus. There was pain in the right iliac fossa on pressure, but no tumour or infiltration could be detected there. The stools were loose of a pea-soup colour, the bowels moving at least twice daily.

The lung conditions were as described above.

The blood was examined microscopically for malaria, and by Widal's test for typhoid fever. Both tests gave negative results.

16th July 1899.—The general condition of this patient remains much the same. She complains greatly of her cough which causes her pain. The sputum consists for the most part of mucus, very little mixed with pus. No blood is present in it. To-day she complains greatly of pain in the abdomen; the situation of the pain or rather the chief intensity of the

pain has changed from the right iliac fossa to an area along the right costal margin. Here on palpation friction fremitus is evident, and is also easily detected by auscultation. There is to-day, considerable tenderness over the tumour previously noted, and it appears to be a little larger in size. The pain extends from the tumour towards the right. Her cerebral condition demands a passing note. When asked a question she looks vacantly for a time, apparently not understanding what has been said, but answers slowly and correctly after a short interval.

19th July 1899.—The condition of this patient has not improved. A subacute form of peritonitis still exists, and her cough is very troublesome causing much pain.

21st July 1899.—Patient remains much as before noted. She has become much emaciated, and the abdominal tumour is if anything larger. The peritonitis to-day is not so severe. No effusion can be detected. The pulse still remains very rapid, and now numbers 160 per minute, respirations 64, and temperature this morning 101°F. There is always a slight evening recrudescence of temperature of from one to two degrees.

22nd July 1899.—Remained in much the same condition as previously noted.

23rd July 1899.—Patient to-day is a little weaker.

24th July 1899.—Yesterday forenoon there was a marked change for the worse in the condition of this patient. She passed two or three blood clots by the rectum, and this was followed by a rapid fall of temperature to 98°F., and was accompanied by a profuse cold perspiration. She, however, rallied for a time, but half an hour before her death at 4-45 P.M., on

the 23rd July, she passed some more blood. Towards the end the patient had become more and more drowsy appearing not to quite appreciate what was said to her. She never at any time complained of pain in the head. The girl although fifteen years of age had never menstruated. Unfortunately no *post-mortem* was granted.

The diagnosis of this case undoubtedly lay between typhoid fever and miliary tuberculosis, and from the negative results obtained by Widal's test I am inclined to favour miliary tuberculosis.

The infection of the intestine by tubercle bacilli was probably the first event in the history of the disease. This led to infection of the mesenteric glands causing their enlargement (the tumour felt on palpation of the abdomen) and ulceration of the intestine. A slight degree of peritonitis seems at first to have been present in the right iliac fossa, the usual situation of tubercular ulcers. Later by the bursting of an enlarged mesenteric gland a slightly more acute diffuse peritonitis arose. General infection seems to have occurred early in the case judging from the well-marked lung signs as well as the cerebral symptoms. The hæmorrhage from the intestine, the ultimate cause of death, was from deep ulceration.

I was almost persuaded at first sight to consider this case one of typhoid fever, but giving a negative result with Widal's typhoid test I was compelled to look for something else; the detection of the small tumour in the abdomen would have been considered of little importance and passed over as a scybalous mass in the intestine had not a negative result been obtained by that test. This tumour then arose

into importance, and led, I believe, ultimately to the proper diagnosis of the disease.

Not only is the microscope of use in the diagnosis of fevers, but I believe of much use in the treatment and prognosis of the fevers. In the above case, on the third day after admission, a very grave prognosis could only be given, the diagnosis having led to the opinion that the case was one of miliary tuberculosis.

In the treatment of ague I believe it is of the utmost importance to study the life cycle of the parasite as the following case illustrates.

Sepoy Rancharran, age forty-two, service twenty-four years, was admitted into hospital suffering from quartan ague.

The patient stated that he had had two attacks of fever in the lines occurring on every fourth day. He was admitted with the third attack, but when I saw him next morning the fever had gone. An examination of his blood at this time revealed nothing. He was detained in hospital. On the following fourth day, 9th July, he had his fourth attack of fever, the rigor beginning at 2-45 P.M. At 3 o'clock he was examined. He was then shivering and complaining of cold and was very restless. His temperature was 102° F. in the axilla, pulse 80. Respirations very rapid and irregular. At 3-15 samples of his blood were taken, and the sporulating stage of the malarial parasite was demonstrated to the Hospital Assistants. The spores numbering from six to eight were collected more or less regularly round a central mass of pigment. The spores themselves were round and slightly less than quarter the diameter of a red blood corpuscle, and contained a small more brightly refractive centre. Specimens obtained at a later hour (7-30 P.M.) showed the parasite as a very

small speck attached to, or within the red corpuscle. Later specimens when the temperature was normal revealed nothing.

Treatment was begun at the beginning of the next attack. The attacks generally began about 3 o'clock so at that hour on the 12th July he received hypodermically 1 gr. Quin. Sulph. dissolved in Spt. Ammon. Aromat. The rigor began at 4-45, and I considered, from the previous study of the parasite in his case, that sporulation would be completed about 6-30 P.M. At 7 P.M., he received 1 gr. Quin. Sulph. dissolved in Spt. Ammon. Aromat. hypodermically. His temperature was then 104.2° . The fever was gone by 10 P.M. when his temperature normal.

On the 16th the date of the next period, he passed through the day all right, but at 11-30 P.M. he had a slight rigor, and his temperature went up to 100.4° F. The fever only lasting for a very short time. No treatment was adopted on this occasion. On the 22nd July the patient was discharged having passed through two periods without fever and without further treatment.

The object aimed at in the treatment was to inoculate quinine directly into the blood at the time of the completion of sporulation, just when the young parasites were free in the blood before they had attached themselves to the red corpuscles. They were then in a vulnerable condition, being young individuals and free in the blood. Once within the red corpuscle it would be more difficult to kill the parasite; it has, as it were, protected itself by the red corpuscle and could not be easily killed till the red corpuscle had been destroyed also. Hence large doses of quinine by the stomach are necessary, especially if given without any thought as to

the exact stage of development of the parasite. The quinine then kills the red corpuscle as well as the parasite, and we see this fact exemplified in some cases where hæmoglobinuria occurs after the administration of quinine. Evidently from the want of success of the first small dose of quinine hypodermically in this case, that medicine in small dose has little effect on the rapidly maturing or matured parasite, for the rigor came on shortly after the first injection.

This method of treatment must commend itself on account of the ease with which it can be applied, and the little inconvenience to the patient, and based as it is on the true pathology of the disease.

Apart from microbes an examination of the blood enables us to study the polynuclear white corpuscles, the soldiers of our body. When an individual is resisting an acute infection well, the number of the polynuclear cells in the blood is increased. We view as it were the line of march, and see the advance guard marching to the attack. With a rising temperature and with many leucocytes in the blood the prognosis of the case as a rule is good. The temperature is an indication of the fierceness of the battle and the number of leucocytes the reserve forces coming up to strengthen the front attack. With a falling temperature and the presence of very few leucocytes in the blood a crisis can almost be predicted with certainty. The furor of the battle is over, no more reserve forces are required to advance, the line of march is free from troops; they are all in their camping grounds.

With a rising temperature and a deficient number of leucocytes in the blood, the individual's resistance is not great, and the prognosis

is as a rule bad. The enemy presses hard at the front, and threatens to become victorious, the reserve forces are wanting, and the day is about to be lost.

In this way a rough sort of prognosis can be made. I have had several opportunities of confirming the above rules, although I cannot state that they are infallible. I could give many instances of cases where the patient has been severely ill with very high temperatures, but an examination of the blood has told me that the fight is progressing favourably, and I have been able thus to keep a light heart.

By the microscopic examination of the blood of a patient suffering from fever we may be enabled —

(1) To diagnose the disease or at least exclude certain well-known fevers, and so leave a few fevers, the nature and cause of which are more or less unknown, and thus enable us the better to study them.

(2) To give a good or bad prognosis by excluding certain virulent fevers, or specifically demonstrating the fever to be one of the less fatal ones. We may be able to estimate the individual's power of resistance to the infection, by a study of the number of his polynuclear white blood corpuscles present in the blood.

(3) To treat certain forms of fever on rational principles, so that much valuable medicine is saved, and the patient's stomach not upset by the wholesale administration of drugs at inopportune moments. We attack the fever in the bud and inoculate into the midst of the enemy a specific poison, not trusting to the changes and chances that may occur in a stomach, the chemistry and absorptive power of which we know so little.

(4) In certain infectious septicæmic diseases, such as plague, we are enabled to know what at least are the very dangerous cases in respect to the spreading of infection by detecting the particular bacillus in the blood. We are thus warned of the necessity to adopt stringent measures for the prevention of the spread of the disease.

It will be understood from the above remarks that a microscopical examination of the blood of patients suffering from fever may help us in the diagnosis, prognosis, treatment and prophylaxis of the disease, and the importance of performing such an easy operation must be evident to all.





